ABSTRACT OF THE DISCLOSURE

This invention presents a method and apparatus for measuring the resistance across a fuel cell stack, a fuel cell array, or an individual fuel cell. The invention employs a fixed load circuit to switch a fixed resistance or to connect a fixed load current to the stack or array. When the load is turned on, the stack voltage is read, then the load is turned off and the stack voltage is read again to determine the voltage jump. A change in resistance is calculated that is related to cell hydration. In accordance with another aspect of the invention, the stack includes a programmable DC-DC switch under PWM microprocessor control. The DC-DC converter is used to switch the load on and off and the voltage jump is read using a sample and hold methodology with an optional instrumentation amplifier and a Kalman filter to determine accurate results for resistance with no additional hardware. The resistance measurements are used to identify and evaluate cell hydration.